December 10 – 11, 2015 Delta ISB Meeting
Agenda Item 7 (Day 1)
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To: Mark Cowin, Director, California Department of Water Resources
Felicia Marcus, Chair, State Water Resources Control Board
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From: Delta Independent Science Board

Regarding: Modeling the effects of barriers and levee breaks on Delta-wide water-quality

In the continuing Delta ISB review of the scientific basis for managing the Sacramento-San Joaquin Delta, we heard two excellent talks on hydrodynamic model applications to explore water quality and flow impacts of drought barriers and flooding of selected Delta islands at our October 2015 meeting. It has long been known that when a barrier is constructed (e.g., to prevent salinity intrusion) or an island or land area in the Delta is flooded (e.g., from an accidental or purposeful levee break or restoration), the impacts on water quality can be widespread and complex. These impacts are driven by interactions of tidal and stream flows with topography, existing water bodies, soils, and mixing. To the Delta ISB, it is clear that these effects and interactions are most reliably predicted through the use of hydrodynamic modeling, particularly for future conditions.

From these and related presentations, we are quite impressed with the modeling capabilities available from agencies, universities, and consulting firms and the broad potential for achieving management and policy insights from hydrodynamic and water quality modeling results. Although these capabilities are impressive, modeling efforts have benefitted and suffered from being fragmented among different entities, with various models being applied with different spatial resolution, boundary conditions, scenarios, and purposes. Although these diverse efforts can help inform specific and immediate management problems, they also can cause confusion and limit broader insights and future applications.

We recommend that a consortium of state and federal agencies undertake a shared systematic hydrodynamic and salinity modeling study of effects of barriers and island flooding on water quality throughout the Sacramento–San Joaquin Delta. Such a broad, joint analysis of water quality interactions, with results for diverse locations across a range of barriers and island-flooding conditions, would more transparently, consistently, and inexpensively inform and help integrate many agency and public discussions, including:

- State Water Project and Central Valley Project planning, operations, and regulation
- Water quality control plans, permits, and other water quality regulations
- Risk assessments and responses due to levee failures
- Delta levee investment policies and decisions
- Emergency planning for responses to levee breaches
- Location, installation, and operation of barriers for drought, water quality, and fish

- Delta-wide water quality impacts of local habitat restoration activities
- Local, state, and federal planning and permitting for wastewater discharges and water diversions for a range of plausible conditions

Existing modeling capability seems sufficient for most of these purposes, but publicly available model applications and results are too limited to provide insights and answers for this range of purposes. Modeling for the Delta Risk Management Strategy (2006) and, more recently, State Water Project water quality effects from levee failures and Delta barrier locations show the value of such studies.

The recommended work should be co-sponsored by the State Water Resources Control Board and the Department of Water Resources, with planning, funding, modeling, and peer-review participation by knowledgeable state, federal, and local agencies and stakeholders, as well as academic and independent experts. It should consider Delta salinity and flow effects at a variety of locations. Model runs could be done for current conditions and for future conditions with sea-level rise. To the extent possible, publicly available models ought to be used for transparency. The results and model output should be made publicly available for additional analysis (such as transport of additional water quality constituents).

The cost and duration of an initial systematic study need not be large. The study could make insightful use of existing input data, existing modeling capabilities, and available science. Such an analysis should yield a shared, coherent, and transparent scientific basis for many important Delta decisions, and would better focus (and often obviate) further project-specific studies. A transparent peer review and assessment of sensitivity and uncertainty of model predictions, and attention to model testing and validation would support this work. Peer review could be facilitated by the California Water and Environmental Modeling Forum and/or the Delta Science Program.

This is an opportunity for state agencies and others to jointly conduct technical work of mutual importance that can provide a common and more coherent basis of knowledge for application to a range of important Delta decisions. We can gladly provide additional information.

Thank you for considering our recommendation for a project which seems both timely and broadly important.